

# OPERATIONAL ASPECTS OF MINE CLOSURE AND DECOMMISSIONING AT THE BASIN CREEK MINE IN MONTANA<sup>1</sup>

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**Abstract.** The Montana Department of Environmental Quality (DEQ) took over management and closure responsibility of the Basin Creek Mine in 2003 after bankruptcy of Pegasus Gold Corporation. Since that time, DEQ has been responsible for a wide range of management, reclamation, and closure activities including (1) securing the site from theft, (2) coordinating with U.S. Environmental Protection Agency reclamation activities at the Luttrell Repository, a mine waste repository located on site; (3) removing inactive and unneeded facilities and infrastructure; (4) removing infrastructure from U.S. Forest Service managed lands; (5) managing stormwater systems; (6) collecting and treating leach pad leachate discharge; (7) land applying stormwater and treated water; (8) performing general site reclamation; (9) inventorying and staging equipment and materials for auction; and (10) conducting a site auction in August 2005. The DEQ is moving toward total mine closure and reclamation by 2010.

Additional Key Words: operations and maintenance, cyanide, heap leach

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## **Introduction**

The Basin Creek Mine was operated from 1989-1992 by Basin Creek Mining Inc. (BCMI) which was owned by Pegasus Mining Company. In June 1998 Pegasus filed for bankruptcy and from December 1998 to March 2003 a bankruptcy trustee oversaw reclamation activities at the Basin Creek Mine.

In April 2003, the bankruptcy case was closed and the property was transferred to the State of Montana. In August 2003 the Montana Department of Environmental Quality (DEQ) retained Tetra Tech, Inc., as a subcontractor to Tetra Tech EM, Inc., to oversee management of the mine property with closure as the ultimate goal.

## **Late August 2003 through October 2003 Activities**

### **Site Security**

Tetra Tech began site management by inventorying capital equipment on site. It was immediately clear that equipment was actively being stolen from the site, including very large items essential to site operation and items that were locked away. Thefts of State owned equipment were valued at \$35,000.00. Tetra Tech and DEQ immediately took steps to prevent the ongoing thefts. Additional thefts were prevented, but none of the stolen equipment was recovered despite a State-offered reward.

### **Leach Pad LP-1 Water Disposal and End of Year Tasks**

The next priority in site management was to neutralize and land apply leachate water from leach pad LP-1. Using on-site electrical pumps and a new Godwin trailer mounted pump, over 3.5 million gallons of water were delivered to the land application disposal (LAD) area by mid-October.

Other critical end of year tasks that were completed are listed below:

- Completed elk fence with access gate around the leach pad LP-1 cyanide process ponds.
- Secured the main plant building exterior access points by repairing overhead door latches and main door locks and by placing expanded metal over broken windows.
- Placed all large hammers, picks, spud bars, acetylene regulators and hoses, chains and slings in the locked tool room.
- Started maintenance on all large equipment. Since none of the diesel equipment came with maintenance logs, crankcase oil, filters, and fuel filters were changed before starting any unit.
- Removed over 5,000 feet of 2-inch yellowmine land application disposal (LAD) lateral piping and 2,300 feet of 10-inch poly piping

from a storm water disposal system located on a part of the site long since reclaimed.

### **May 2004 through October 2004 Activities**

The first full season at the Basin Creek Mine was a continuation of 2003 activities of repairing engine operated equipment and fully inventorying the material and equipment DEQ had acquired.

#### **Storm Water Handling and Pond SP-8**

Storm water had previously been pumped to various discharge points using large electric pumps. In an effort to minimize the labor and expense of handling storm water, DEQ and Tetra Tech placed controlled diversions to existing waterways to limit water inflows to the storm water collection ponds. Rather than pump water from the ponds, small siphons were used to empty the ponds over an extended period. A large part of the storm water pond reclamation effort involved pond SP-8, which at one time collected runoff from the north portion of the mine site that had been reclaimed in 1992-1993. Pond SP-8 reclamation involved the following:

- Removed two 150 horsepower (hp) electric high head pumps and all ancillary electrical equipment.
- Removed over 1,400 feet of heavy wall 10-inch poly pipe from the pond to the LAD area.
- Emptied and relocated the 4,000-gallon diesel storage tank and generator skid pad from the pond SP-8 generator site, pulled up the fuel tank liner and geomat, contoured and scarified the site, and seeded it to grass.
- Converted pond SP-8 from a storm water pond to part of a controlled drainage/wetland system by removing the liner and geomat from the dike walls, constructing a spillway at the lower end, contouring the surrounding sidewalls to a more natural configuration, and finally seeding the entire area to grasses.

#### **Equipment and Surplus Material**

The scaled down operations at the mine site resulted in an excess of equipment and material. DEQ and Tetra Tech collected, sorted, and, when possible, placed on pallets excess equipment and material in preparation for disposal at an auction. The goal was to stage and have ready for auction pumps, piping, and motor controls upon relocating these large items from various locations at the mine site. In some cases, the number and variety of parts and supplies were so large, the only option was to separate out the parts (filters, bearings, seals, or other parts) that would work on equipment on site and leave the rest for auction. Every effort was made to handle materials only once.

### Leach Pad LP-1 Water Treatment

Two batches of LP-1 leachate were treated in 2004 and applied to the LAD areas. Cyanide degradation of over 7,650,000 gallons of water was accomplished through air sparging, recirculation pumping, and using hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) as the final treatment process to achieve the discharge criterion of 0.20 milligrams per liter (mg/L) total cyanide. Discharge pumping to the LAD area was handled by the Godwin pump at an average fuel consumption of 1.1 gallons per hour (gph) at a flow rate that averaged 300 gallons per minute (gpm). At the end of pumping, mainline dump valves and end-of-line valves on the laterals were opened to remove detritus and prevent freeze-up over the winter.

The high cost of  $\text{H}_2\text{O}_2$  (about \$6.00 per gallon) relegated its use to the final treatment of leachate water. Whereas the large on-site generators were necessary for transfer pumps and plant power, adding more load to run recirculation pumps and sparging blowers did not result in greatly increased diesel consumption over an 11-hour day.

### **May 2005 through November 2005**

### Leach Pad LP-1 Water Treatment

Upon arrival at the mine site in late May, the water levels in leach pad LP-1 leachate ponds BP-1 and BP-2 were so high, only about 3 feet of freeboard remained. Recirculation pumps were started and air sparging began. Following sampling of the pond BP-2 water, treatment with  $\text{H}_2\text{O}_2$  began. Continued inflow to the ponds demanded that treatment begin immediately.

By the end of June, fourteen drums of  $\text{H}_2\text{O}_2$  had been used to meet the 0.20 mg/L criterion for LAD application. The first batch of leachate (4,721,000 gallons) was land applied over three weeks using the Godwin pump. The last batch of water (5,766,500 gallons) was treated and discharged during September and October, following the auction. This last batch of leachate used only 10 drums of  $\text{H}_2\text{O}_2$ . In order to expedite the process, 1.62 million gallons of water were pumped from storm water pond SP-2 to help dilute the leachate and reduce the  $\text{H}_2\text{O}_2$  necessary for degradation.

## Equipment Auction

During August, Tetra Tech staff worked with the auction firm to sort and place on pallets equipment and supplies for the auction. Every engine or engine-operated piece of equipment was in operable condition at the time of the auction, and was started, if requested, to confirm its operational status. The auction, held on August 25, 2005, grossed \$121,570.00 from 397 lots of equipment and material. For two weeks following the auction, Tetra Tech staff assisted successful bidders in loading their purchases, with assistance from Shumaker Trucking and Excavation, Inc. of Great Falls, Montana for the very large, heavy units.

## Site Closure Efforts

The 2005 season closed out with efforts to remove unused and no longer needed LAD laterals and mainlines. This task was conducted by two staff and involved chain saw clearing of deadfall on the pipes, removal of sprinkler risers and rebar support stakes, and removal of all valves and couplers from the pipelines. As these materials were removed from U.S. Forest Service (USFS) property, the yellowmine pipe was stored at the bone yard and the large diameter mainline piping was cut into 40-foot sections for ease of handling and sorted by size for a future auction.

## **Lessons Learned and Pitfalls to Avoid**

Since taking over the management, reclamation and closure of the Basin Creek Mine site, Tetra Tech and DEQ have learned a great deal. Maintaining on-site equipment, managing water treatment, reclaiming the site, and working with a variety of different agencies and contractors, have followed standard mine reclamation procedures and been successful. Some of the more important lessons learned at the Basin Creek Mine involved site security and management transition issues. The lessons learned are as follows:

- Establish site security immediately upon assuming title to the property. Time and resources are necessary to change locks on gates at all access points and to ensure that buildings with tools and other equipment and supplies are secure.
- Immediately remove hitches and wheels from trailer-mounted equipment, record serial and model numbers, and photograph all high end capital equipment.
- Be cautious in following previously established guidelines and procedures.
- Set reasonable goals for a season's reclamation expectations and whether or not such expectations fit into the long range plan.